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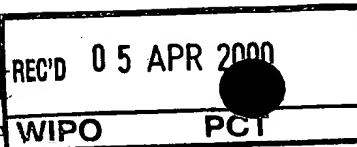
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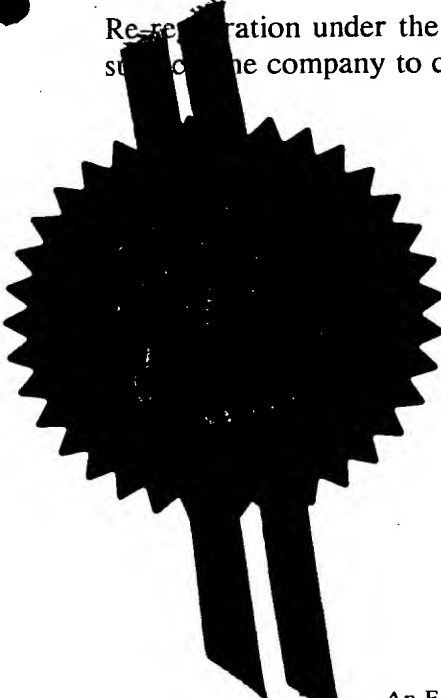
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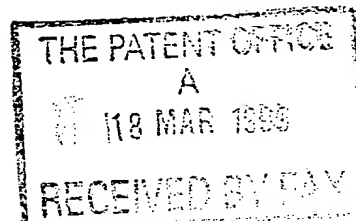
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1. Your reference

RICN\P20635GB

2. Patent application number

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Closures and Packaging Services Limited
P.O. Box 119, Commerce House
St Peter Port, Guernsey
Channel Islands GY1 3HB
United Kingdom

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

7120272001

4. Title of the invention

CLOSURE WITH SEAL MEMBER

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ERIC POTTER CLARKSON
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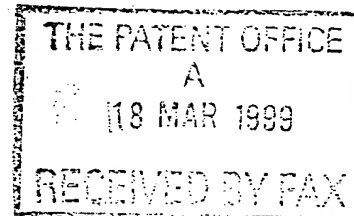
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Closure with seal member

Technical Field

The present invention relates to linerless closures for containers. More particularly, the invention relates to such closures for use in hot fill and
5 aseptic processes.

Background Art

Refrigeration or preservatives are two techniques that have long been used for ensuring that foods and beverages remain suitable for consumption by consumers. Canning, where products are heated in the container over a
10 period of time, has also long been used as a means of sterilising food products.

Hot fill and aseptic processing are two more recent techniques developed for sterilising foods and beverages. Hot fill processing is used in the packaging of beverages such as iced tea, water and fruit juice. Aseptic
15 processing is also used in the packaging of these products and other foods including milk, soups, yoghurts and tomato products.

In the hot fill process, the containers are filled with the beverage while the beverage is still hot. This process serves to sterilise the beverage before sealing of the container. Beverages packed in this way can be shipped
20 without the need to provide refrigeration of the containers.

Due to the temperatures involved, the hot fill process results in an expansion of the container and closure subsequent to the filling and sealing of the container. The subsequent cooling of the container typically extends over a considerable period and creates a partial vacuum inside the container
25 due to contraction of the beverage and of the air in the void above the beverage.

Closures for sealing containers filled using the hot fill process must be able to withstand the high temperatures of the filling process and remain sealed to the container during cooling of the container after filling. Closures
30 for hot fill application usually comprise a polypropylene cap having a top and depending skirt, with a wad or liner positioned within the cap and fixed to the underside of the top.

Linerless closures have also been proposed for use in hot fill applications. Typically, such linerless closures rely on a bore seal that
35 extends into the bore of the end portion of the container and seals with the inside surface of the end portion of the container. By having a bore seal that

extends well down the inside surface of the end portion of the container, the prospect of loss of seal due to differential shrinkage of the closure and the container during the hot fill process is minimised.

5 In aseptic packaging, the container is sterilised and filled with a sterile food product within the confines of a hygienic environment. The liquid food or beverage is sterilised outside the container using an ultra-high temperature process that rapidly heats, then cools the product before filling the container. Any packaging used in the aseptic process must be able to preserve the sterilisation of the package's contents until the package is opened by the end
10 consumer. One form of aseptic packaging container presently used is a box-shaped package that is a laminate of paperboard, polyethylene and aluminium.

Certain linerless closures have been proposed for use in sealing containers for carbonated beverages. United States patent specification
15 5,423,444 discloses a plastic closure for a container having an externally screw threaded neck, the closure including a top portion and an internally threaded skirt. The closure has an annular sealing rib which projects downwardly from the underside of the top portion. The rib includes a first substantially cylindrical portion contiguous with the underside of the top
20 portion and lying adjacent to or abutting with the skirt, and a second, frusto-conical, portion contiguous with the end of the first portion distal to the underside of the top portion and extending radially inwardly to a circular free edge. During threaded attachment of the closure with the neck, the second, frusto-conical, portion will be engaged by a free end of the neck and folded
25 back against the first, substantially cylindrical portion of the rib to form a gas tight seal between at least the outer surface of the neck of the container and the closure.

United States patent specification 5,609,263 discloses a variant of the above closure in which there is at the free end of the second portion of the
30 rib a thick seal ring of substantially circular cross-sectional shape. The rib and the seal ring are dimensioned to engage the free end of the neck when the closure is threaded onto the neck such that when the neck is fully screwed into the closure its free end crushes the seal ring directly against the inside surface of the top portion of the closure.

35 International Patent Application No PCT/AU98/00510 (WO 99/03746) discloses still further variants of the closure described in US 5,423,444. In

one variant, the sealing rib of the closure has a third portion connected to the second portion at or adjacent its circular edge and extending generally in a direction away from the top portion. The third portion is substantially no thicker than the second portion and has a length longer than its thickness.

5 On attachment of this closure to a container, the third portion is positioned between the neck of the container and the underside of the top portion of the closure.

The present invention is directed to a sealing rib arrangement for closures that further improves the sealing ability of linerless closures of the
10 type identified in the abovementioned prior art particularly when used in the hot fill process.

Disclosure of the Invention

According to a first aspect, the present invention relates to a closure suitable for mounting onto a container having an opening defined by an end
15 portion of the container, the closure being moulded from a synthetic plastics material and including a top portion and a skirt portion depending from the top portion, an annular sealing rib projecting downwardly from an underside of the top portion, the rib including a first portion which is contiguous with
20 inwardly of the skirt portion and at least a second, frusto-conical, portion contiguous with the first portion and separated from the top portion by the inner surface of the first portion, the second portion having an upper side and an underside and extending radially inwardly to a circular edge, the inner surface of the first portion having an internal diameter relative to the
25 external diameter of the end portion of the container to which the closure is to be attached such that during attachment of the closure with the end portion of the container, the sealing rib will be engaged by said end portion of the container so folding the second portion towards at least the inner surface of the first portion of the rib to form a seal between at least an outer
30 surface of the end portion of the container and the closure, the closure being characterised in that there is an annular protrusion formed on the underside of the second portion and extending outwardly therefrom, the protrusion being so arranged that during attachment of the closure with the end portion, the protrusion engages the outer surface of the end portion so causing the
35 sealing rib to be disposed over a greater area of the outer surface of the end portion of the container.

In a preferred embodiment, the annular protrusion comprises an annular ridge extending outwardly to a peak. The ridge is preferably substantially triangular in cross-section. One surface of the ridge preferably comprises an end portion engaging surface that acts to extend the area of the seal between the second portion and the end portion on attachment of the closure to the container.

In one embodiment, the annular protrusion can have a resiliently flexible member extending outwardly from the peak of the annular ridge. The flexible member, on attachment of the closure, engages the outer surface of the end portion and is flexed relative to the ridge. The flexing of the flexible member serves to provide further extension of the sealing area between the second portion and the outer surface on attachment of the closure.

The end portion of the container to be sealed by the present invention preferably has a free end, an outside, preferably cylindrical, surface and an inside, preferably cylindrical, surface, the inside surface defining a bore. The join between the free end and the inside surface and the join between the free end and the outside surface are each preferably smoothly curved and define respectively what are hereinafter called the inner and outer sealing radii of the end portion of the container. Containers having end portions which do not have an inner and/or an outer sealing radii will of course be sealable by the closure defined herein.

The closure is preferably provided with a screw thread on an inside surface of the skirt portion adapted to engage with a corresponding thread on an external surface of the end portion of the container. It is, however, possible for the container and the closure to be formed with other complementary attachment means. Such an arrangement could, for instance, comprise snap-on attachment means having a rib on the inside surface of the closure and a corresponding groove on the outside surface of the end portion of the container.

The inner surface of the first portion is preferably substantially cylindrical. The first portion of the rib can comprise a thickening of the skirt portion in the region adjacent its connection to the top portion. By comprising such a thickening, the root of the second portion of the rib is moved inwardly of the part of the skirt portion having the screw thread or other attachment means.

In another embodiment, the first portion of the sealing rib is formed radially inwardly of the skirt portion with an annular space therebetween. In a still further embodiment, the first portion of the sealing rib can be in abutment with the skirt portion.

5 In yet a further embodiment, the first portion of the rib can have a thickness that increases as it extends in a direction away from the top portion of the closure. This thickening of the first portion serves to increase the force of the pressure of the rib against the outside surface of the end portion of the container on attachment of the closure to the end portion. The thickness of
10 the first portion can increase at a uniform rate along the length of the first portion away from the top portion, however, it could do so in a non-uniform manner. The increase in the thickness of the first portion means that the inside surface and, where there is one, the outside surface, of the first portion will each not necessarily be exactly cylindrical. They may respectively taper
15 slightly inwardly and outwardly relative to the axis of the closure in a direction away from the top portion of the closure.

The inner surface of the first portion serves to form an abutment towards which the second portion is folded during attachment of the closure with the end portion of a container. Preferably, during attachment, the
20 second portion will be folded back against the first portion such that it bears against the inner surface of the first portion. This will cause the second portion, including the annular protrusion, to bear more strongly against at least the outside surface of the end portion of the container and so form a better seal with at least the outside surface of the end portion.

25 In a further embodiment, the sealing rib can include a third portion connected to the second portion at or adjacent the circular edge of the second portion and extending generally in a direction away from the top portion. The third portion is preferably substantially no thicker than the second portion and further preferably has a length longer than its thickness. The
30 third portion of the sealing rib is preferably contiguous with the circular edge of the second portion, though it may be spaced slightly radially outwardly from it. The third portion also preferably projects generally axially away from the top portion of the closure to its distal end. The third portion is preferably substantially cylindrical and can have both a cylindrical inner
35 surface and a cylindrical outer surface. The third portion can join the second portion in an angular disjunction or it may join it in a smooth angular

transition from the generally radially inward direction of the second portion to a generally axial direction. In this embodiment, on attachment of the closure to the end portion of the container, the third portion preferably seals with the end portion from a position on the outside surface of the end portion to at least the apex of the free end of the end portion.

The closure according to the present invention may be made of any suitable synthetic plastics material, however it is preferred that it is formed from a suitable grade of polyethylene or polypropylene. It is also preferred to form the closure in one piece. The closures could, however, be formed in two or more parts with at least the sealing rib formed separately from the top portion and the skirt portion.

It will be apparent to persons skilled in the art that numerous modifications may be made to the closure described in this specification without departing from the scope of the invention as earlier defined. The closure, for instance, is preferably provided with a tamper evident band adapted to provide an indication of removal or attempted removal of the closure from a container. The tamper evident band can extend from the skirt portion by connection through a plurality of frangible bridges. As the closure is removed from a container, the tamper evident band preferably provides an indication of this removal either before or as the second portion of the sealing rib disengages with at least the outer surface of the end portion of the container. This serves to ensure the integrity of the container's contents, that may have been filled by a hot fill or aseptic process, until ultimate consumption or use by the consumer of the container's contents.

As is described in Australian patent specifications 668197, the contents whereof are incorporated herein by reference, the band can also comprise a generally cylindrical body portion and a segmented rib extending inwardly of the body portion and adapted to provide a lip having an inner free edge to engage under a retaining flange extending outwardly from the end portion of the container. The combined length of the segmented ribs can be equal to at least 50% of the internal circumference of the band and the segmented ribs are preferably separated from each other by a gap. Each of the rib segments can each have an upper surface facing generally towards the top portion of the closure and an underside facing generally away from the top portion, with the inner surface of the band having a plurality of radially

inward projections extending from above the free edge of the band and not extending beyond the inner free edge of the lip.

As is described in Australian patent specification 683598, the contents whereof are incorporated herein by reference, the upper surface of each rib segment extending inwardly of the body portion can comprise a first surface contiguous with the body portion of the band, which surface slopes inwardly and downwardly away from the top portion, and a second surface which extends radially inwardly from the inner terminus of the first surface and has a slope angle substantially normal to the skirt portion of the closure.

As is described in US 5,676,269, the contents whereof are incorporated herein by reference, the tamper evident band can be joined to the skirt portion of the closure by a plurality of frangible bridges and at least one non-frangible bridge. The band can further have a substantially L-shaped slot extending through the side wall of the band, the horizontal leg of which terminates directly adjacent to or under the non-frangible bridge, and a weakened frangible region extending from the terminating end of the horizontal leg axially downwardly to the bottom of the band distal the frangible bridges.

The underside of the top portion of the closure can also have an engagement means comprising a continuous or segmented annular ridge radially inside of the sealing rib. The upper side of the second portion of the rib may also be formed with a complementary engagement means comprising a continuous or segmented annular ridge as is described in US 5,782,369, the contents whereof are incorporated herein by reference. On attachment of the closure with the end portion, the engagement means on the second portion engage with the underside of the top portion. Where the underside of the top portion has the complementary engagement means, the respective complementary engagement means preferably are adapted to interlock as the closure is attached to the container thereby holding the sealing rib touching the underside of the top portion stationary and causing the second portion of the sealing rib to be disposed over a still greater area of the underside of the top portion as well as the outside surface of the end portion.

Where the closure has a screw thread on the inner surface of the skirt, the thread can be continuous or formed of a series of thread segments. If formed from a series of thread segments, the thread segments can be arranged, starting from a first thread segment distal to the top, along a helical

thread locus, as is described in Australian patent specification 668197. Each of the thread segments except the first can be formed with two substantially planar end surfaces that are inclined to the axis of the closure and face away from the top of the closure, that is they face in the direction that a mould
5 core used to mould the closure was withdrawn. In this specification, the term "substantially planar surface" is used to describe a surface that is nearly actually planar or that is curved provided that it all faces in the defined direction. The first of the thread segments is preferably pointed at its end distal to its one adjacent thread segment to assist in mating the thread on the
10 closure with a complementary thread on the neck of a container.

The substantially planar ends of the thread segments can also be inclined to a notional radial plane of the closure extending from the longitudinal axis of the closure to the end of the respective thread segment such that the ends are inclined to the cylindrical skirt by an angle that is less
15 than the angle that the respective notional plane makes with that skirt.

There also can be at the line of meeting of the first and second portions of the sealing rib, a weakened zone or annular region of weakness to assist even deformation of the second portion relative to the first as the closure is attached to a container as is described in Australian patent specification
20 837706, the contents whereof are incorporated herein by reference.

In a further aspect, the present invention comprises a mould for forming a closure as defined in any one of the preceding claims. The mould can be used to form the closure using injection or rotary moulding. It will be appreciated by persons skilled in the art that other suitable techniques for
25 forming the closure could also be utilised.

Brief Description of Drawings

The following description of a preferred embodiment of the present invention is provided as an example of the invention and is described with reference to the accompanying drawings, in which:-

30 Fig. 1 is an enlarged sectional view of a portion of a closure according to the first aspect of the present invention before attachment with the end portion of a container, and

Fig. 2 is an enlarged sectional view of a portion of the closure of Fig. 1 sealingly engaged with the neck of a container.

Best Mode for Carrying Out the Invention

The closure 10 shown in Fig. 1 comprises a circular top 11 and a depending skirt 12. The radially inner surface of the skirt 12 is provided with a screw thread (not visible) that is adapted to mate with a corresponding
5 thread on the neck of a bottle 16 to which the closure 10 is adapted to be attached. While the embodiment of the closure depicted in the drawings has a screw thread, other suitable means for attaching the closure 10 to the bottle 16 would be immediately apparent to a person skilled in the art.

The bottle 16 can be fabricated from a plastics material such as
10 polyethylene terephthalate (PET). The bottle is preferably adapted to be used in a hot fill or aseptic filling process. As depicted in Fig. 2, the bottle 16 has an end portion 30 having a free end 31, an outer cylindrical surface 32, and an inner cylindrical surface 33. The join between the free end 31 and the outer
15 surface 32 is smoothly curved and defines an outer sealing radius 34 for the end portion 30 of the bottle 16. Bottles having an end portion 30 which do not have an outer sealing radius will of course be sealable by the closure defined herein. The closure 10 is formed integrally from high density polyethylene by injection moulding.

The radially outer surface of the skirt 12 carries a series of fine vertical
20 ribs 13. The fine ribs 13 in the depicted embodiment terminate at the lower edge of the skirt 12 in a narrow circumferential rib (not visible).

A sealing rib 20 is provided on the underside of the top 11 of the closure 10. The rib 20 is continuous and annular. Seen in cross-section the rib 20 has two portions, a first portion 14 contiguous with the top 11 and
25 spaced apart from the skirt 12 and a second portion 15. While depicted spaced from the skirt 12, the first portion 14 can, in another embodiment, comprise a thickening of the skirt 12 adjacent the top 11 or can abut the skirt 12. The inner surface 19 of the first portion 14 is substantially cylindrical, while the second portion 15, prior to attachment to the bottle 16, is frusto-
30 conical in form. The second portion 15 is of substantially constant thickness as it extends radially inwardly from its outer edge which is contiguous with the lower end of the first portion 14. While depicted as being of substantially constant thickness, it will be envisaged that the second portion 15 can taper slightly in thickness as it extends radially inwardly from its outer edge. A
35 relatively sharp edge 21 is formed between the first portion 14 and the second portion 15. This sharp edge 21 defines a line of weakness between

the two portions for a purpose that will be described later in this specification.

5 The underside of the second portion 15 has an annular ridge 22 extending outwardly to a peak 23. The ridge 22 is substantially triangular in cross-section, with one surface 24 being adapted to engage and so seal with the outer surface 32 of the end portion 30 of the bottle 16. The ridge 22 also has a resiliently flexible member 25 that extends outwardly from the peak 23 thereof. As depicted in Fig.2, the flexible member 25, on attachment of the closure 10, engages the outer surface 32 of the end portion 30 and is flexed
10 relatively outwardly. This flexing of the flexible member 25 serves to provide further extension of the sealing area between the second portion 15 and the outer surface 32 on attachment of the closure 10, as depicted in Fig. 2.

15 The second portion 15 also has formed on its upper surface and proximate its free edge, a continuous annular ridge 17. The underside of the top 11 has formed on its surface inwardly of the first portion 14 a continuous annular ridge 18. As the closure is attached to the end portion 30 of the bottle 16, the second portion 15 contacts the free end 31 of the bottle 16 and is caused to fold up towards and, in this case, against the inner surface 19 of
20 the first portion 14. As the closure 10 is further attached to the bottle 16, contact is made between the underside of the top 11 and the ridge 17 and between the ridge 18 and the upper surface of the second portion 15.

25 Upon still further attachment of the closure 10, the ridge 17 abuts with the ridge 18 thereby ensuring the second portion 15 is wedged between the free end 31 of the bottle 16 and the underside of the top 11, i.e. the movement attaching the closure 10 tends to pinch the second portion 15 of the rib 13 between the free end 31 of the bottle 16 and the underside of the top 11 and to pull the frusto-conical portion 15 tightly in towards the outer sealing radius 34 and the outer surface 32 of the end portion 30 to produce a tight
30 seal that extends from the free end 31 around the outer sealing radius 34 and well down the outer surface 32 of the end portion 30 of the bottle 16.

35 The extension of the sealing area well down the outer surface 32 of the end portion 30 serves to delay the loss of seal between the closure 10 and the end portion 30 when the closure 10 is begun to be removed from the bottle 16. In the depicted embodiment, loss of seal does not occur until after or just as a tamper evident band (such as defined herein) provides an indication of

11

removal or attempted removal of the closure 10 from the bottle 16. This is particularly important in the case of containers that have been filled by a hot fill or aseptic process, where it is important that the consumer have confidence of seal integrity between the closure 10 and the bottle 16 up until the time that the closure 10 is actually removed from the bottle 16.

5 It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to
10 be considered in all respects as illustrative and not restrictive.

11/03/98

15

Claims

1. A closure suitable for mounting onto a container having an opening defined by an end portion of the container, the closure being moulded from a synthetic plastics material and including a top portion and a skirt portion depending from the top portion, an annular sealing rib projecting downwardly from an underside of the top portion, the rib including a first portion which is contiguous with the top portion and having an inner surface, which inner surface lies radially inwardly of the skirt portion and at least a second, frusto-conical, portion contiguous with the first portion and separated from the top portion by the inner surface of the first portion, the second portion having an upper side and an underside and extending radially inwardly to a circular edge, the inner surface of the first portion having an internal diameter relative to the external diameter of the end portion of the container to which the closure is to be attached such that during attachment of the closure with the end portion of the container, the sealing rib will be engaged by said end portion of the container so folding the second portion towards at least the inner surface of the first portion of the rib to form a seal between at least an outer surface of the end portion of the container and the closure, the closure being characterised in that there is an annular protrusion formed on the underside of the second portion and extending outwardly therefrom, the protrusion being so arranged that during attachment of the closure with the end portion, the protrusion engages the outer surface of the end portion so causing the sealing rib to be disposed over a greater area of the outer surface of the end portion of the container.
2. The closure of claim 1 wherein the annular protrusion comprises an annular ridge extending outwardly to a peak.
3. The closure of claim 2 wherein the ridge is substantially triangular in cross-section.
4. The closure of claim 3 wherein one surface of the ridge comprises an end portion engaging surface that acts to extend the area of the seal between the second portion and the end portion on attachment of the closure to the container.
5. The closure of any one of the preceding claims wherein the annular protrusion has a resiliently flexible member extending outwardly from the peak of the annular ridge.

6. The closure of any one of the preceding claims wherein a screw thread is provided on an inside surface of the skirt portion that is adapted to engage with a corresponding thread on an external surface of the end portion of the container.
- 5 7. The closure of any one of the preceding claims wherein the first portion of the rib comprises a thickening of the skirt portion in the region adjacent its connection to the top portion.
8. The closure of any one of claims 1 to 6 wherein the first portion of the sealing rib is formed radially inwardly of the skirt portion with an annular space therebetween.
- 10 9. The closure of any one of claims 1 to 6 wherein the first portion of the sealing rib abuts the skirt portion.
10. The closure of any one of the preceding claims wherein the inner surface of the first portion is substantially cylindrical.
- 15 11. The closure of any one of claims 1 to 9 wherein the first portion of the rib has a thickness that increases as it extends in a direction away from the top portion of the closure.
12. The closure of claim 11 wherein the thickness of the first portion increases at a uniform rate along the length of the first portion away from the
- 20 top portion.
13. The closure of any one of the preceding claims wherein the sealing rib includes a third portion connected to the second portion at or adjacent the circular edge of the second portion and extending generally in a direction away from the top portion to a distal end.
- 25 14. The closure of claim 13 wherein the third portion is substantially no thicker than the second portion.
15. The closure of claim 14 wherein the third portion has a length longer than its thickness.
16. The closure of any one of claims 13 to 15 wherein the third portion
- 30 projects generally axially away from the top portion of the closure to its distal end.
17. The closure of any one of claims 13 to 16 wherein the third portion is substantially cylindrical and has both a cylindrical inner surface and a cylindrical outer surface.

18. The closure of any one of claims 13 to 17 wherein the third portion joins the second portion in a smooth angular transition from the generally radially inward direction of the second portion to a generally axial direction.
19. The closure of any one of the preceding claims wherein the closure is
5 made from polyethylene.
20. The closure of any one of the preceding claims wherein the closure is formed in one piece.
21. The closure of any one of the preceding claims wherein the closure has
10 a tamper evident band adapted to provide an indication of removal or attempted removal of the closure from a container.
22. The closure of claims 21 wherein the tamper evident band extends from the skirt portion by connection through a plurality of frangible bridges.
23. The closure of claims 21 or 22 wherein as the closure is removed from
15 a container, the tamper evident band provides an indication of this removal either before or as the second portion of the sealing rib disengages with at least the outer surface of the end portion of the container.
24. The closure of any one of the preceding claims wherein an underside of the top portion of the closure has an engagement means comprising a continuous or segmented annular ridge radially inside of the sealing rib.
- 20 25. The closure of claim 24 wherein the upper side of the second portion of the rib has a complementary engagement means comprising a continuous or segmented annular ridge and wherein, on attachment of the closure with the end portion, the complementary engagement means are adapted to interlock thereby holding the sealing rib touching the underside of the top
25 portion stationary and causing the second portion of the sealing rib to be disposed over a still greater area of the underside of the top portion as well as the outside surface of the end portion.
26. The closure of any one of the preceding claims wherein at the line of
30 meeting of the first and second portions of the sealing rib, a weakened zone or annular region of weakness is provided to assist even deformation of the second portion relative to the first as the closure is attached to the end portion of the container.

- 15 -

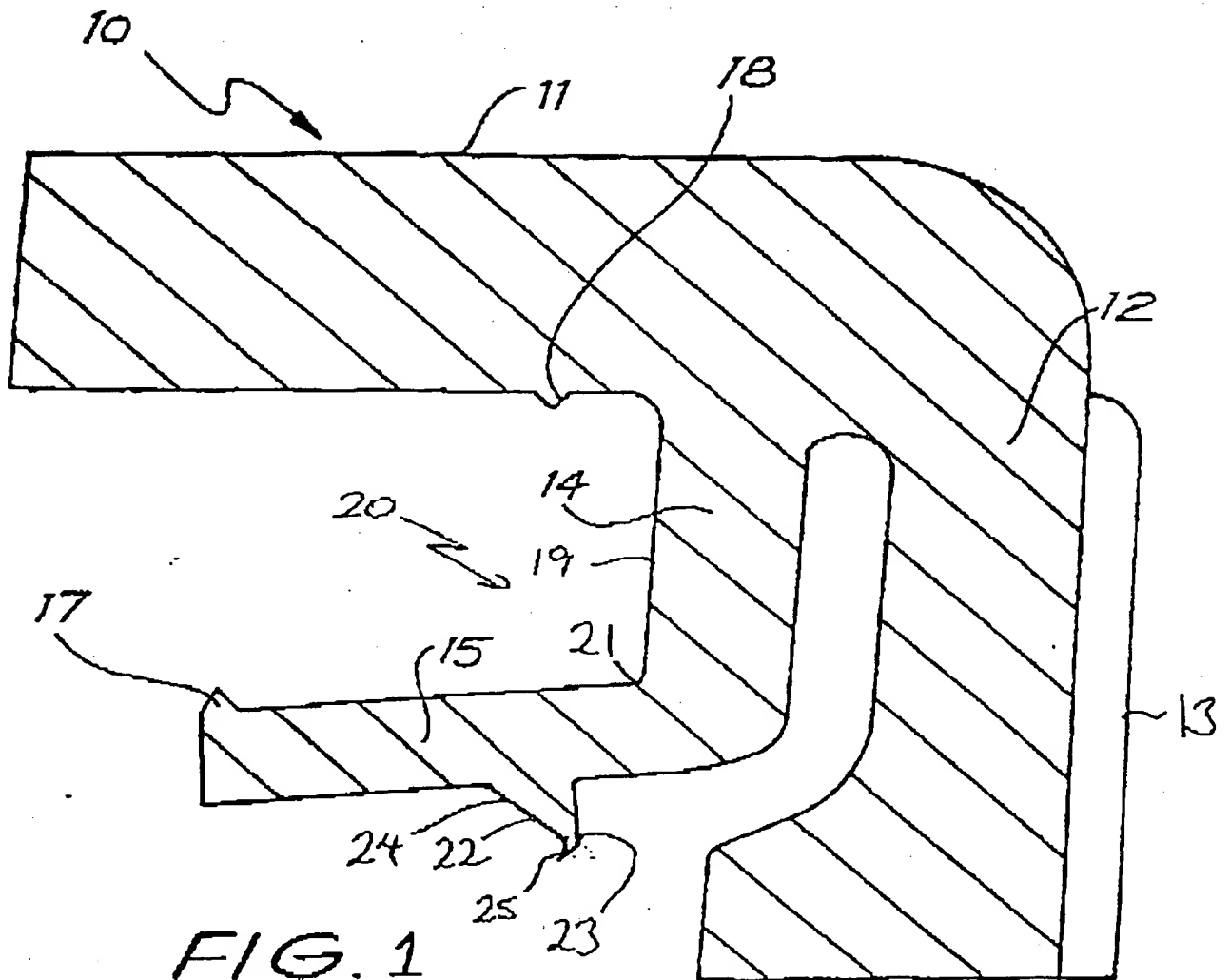
ABSTRACT

CLOSURE WITH SEAL MEMBER

A closure suitable for mounting onto a container having an opening defined by an end portion of the container, the closure being moulded from a synthetic plastics material and including a top portion and a skirt portion depending from the top portion, an annular sealing rib projecting downwardly from an underside of the top portion, the rib including a first portion which is contiguous with the top portion and having an inner surface, which inner surface lies radially inwardly of the skirt portion and at least a second, frusto-conical, portion contiguous with the first portion and separated from the top portion by the inner surface of the first portion, the second portion having an upper side and an underside and extending radially inwardly to a circular edge, the inner surface of the first portion having an internal diameter relative to the external diameter of the end portion of the container to which the closure is to be attached such that during attachment of the closure with the end portion of the container, the sealing rib will be engaged by said end portion of the container so folding the second portion towards at least the inner surface of the first portion of the rib to form a seal between at least an outer surface of the end portion of the container and the closure, the closure being characterised in that there is an annular protrusion formed on the underside of the second portion and extending outwardly therefrom, the protrusion being so arranged that during attachment of the closure with the end portion, the protrusion engages the outer surface of the end portion so causing the sealing rib to be disposed over a greater area of the outer surface of the end portion of the container.

(Figure 2)

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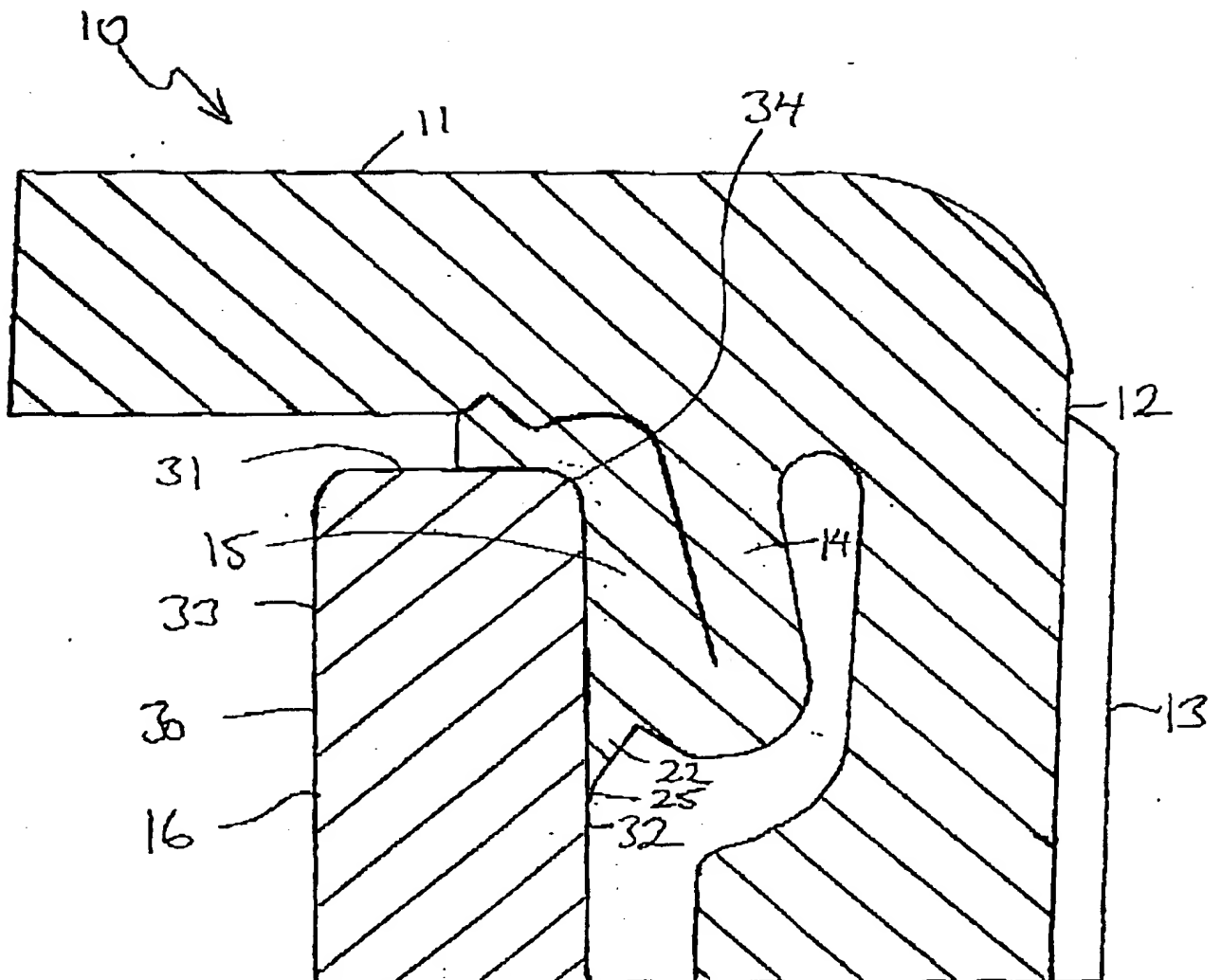


Fig. 2

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